

IMPACTS OF GLOBAL ECONOMIC POLICY UNCERTAINTY ON EMERGING STOCK MARKETS: EVIDENCE FROM LINEAR AND NON-LINEAR MODELS

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Abstract

Global economic policy uncertainty (GEPU) is one of important phenomena in the global economy; it can impact on the overall economic performance and stock market performance, regardless of the status of the world economy. Thus, this paper empirically investigates the impact of global economic policy uncertainty on the Malaysian stock market over the period from 10:2003 to 2017:03. Using the GARCH model, the study demonstrates that global policy uncertainty affects the Malaysian stock market negatively. Similarly, the SVAR model also shows results consistent with the GARCH estimation. Nevertheless, the Markov switching estimation uncovers that global policy uncertainty has negative impacts on stock market performance in both low and high volatile market states. The impact is, however, greater during the high volatile state. Hence, the relationship between global economic policy uncertainty and stock market returns tends to be asymmetric. The overall empirical results infer that global economic policy uncertainty has some implications for asset pricing.

Keywords: Global economic policy uncertainty, GARCH, Markov switching, Malaysia, stock market

JEL Classification: C58, E32, E37, E44, E52, E62, F50, F65, G10

1. Introduction

Since the development of the Economic Policy Uncertainty (EPU) index, research approachability towards it has been growing. Employing the EPU index as an explanatory variable, researchers have been exploring effects of EPU on various macroeconomics

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indicators such as corporate governance (e.g., Zhang *et al.*, 2015), investment behaviour (Wang *et al.*, 2014), economic development (Scheffel, 2015), monetary policy effects (e.g., Aastveit *et al.*, 2017), commodity markets (e.g., Andreasson *et al.*, 2016; Antonakakis *et al.*, 2014; Kang *et al.*, 2017b; Reboredo and Uddin, 2016; Wang *et al.*, 2015), and stock and bond markets (Arouri *et al.*, 2016; Ko and Lee, 2015; Liu and Zhang, 2015). The empirical evidence has proven that EPU affects every level of the real economy. Recently, Baker *et al.* (2016) developed the Global Economic Policy Uncertainty index, which can make it easier for researchers to focus on how global economic policy uncertainty affects regional economic performance.

Studies covering the relationship between EPU and stock markets focused mainly on the US stock market, the European market and a few selected emerging markets (e.g., Antonakakis *et al.*, 2013; Arouri *et al.*, 2016; Belo *et al.*, 2013; Brogaard and Detzel, 2015; Chang *et al.*, 2015; Dakhlaoui and Aloui, 2016; Kang and Ratti, 2013; Kang *et al.*, 2017a, 2017b; Ko and Lee, 2015; Liu and Zhang, 2015; Tsai, 2017). All these studies evidence that EPU has negative impacts on stock market performance, but approachability the effects and relationships vary over time. However, all these studies consider regional policy uncertainty on the aggregated stock market index. Furthermore, to the best of our knowledge, none of the researchers has focused on global economic policy uncertainty (GEPU) and its impacts on stock market returns. Thus, there is a question of how stock market performance is impacted by GEPU. Understanding the impact of GEPU on emerging stock markets is important for asset pricing and portfolio management. In addition, emerging stock markets tend to be more volatile to global factors than developed markets. Thus, considering this, the study intends to explore how global economic policy uncertainty impacts on stock market performance of Malaysia.

There are a few specific reasons for selecting the Malaysian stock market for investigating impacts of global economic policy uncertainty on emerging stock market performance. First, the Malaysian stock market is a fast-growing emerging stock market. Therefore, it is extremely volatile to external shocks or innovations (see Basrky and Kilian, 2006). Second, a few studies have shown that uncertainty shocks originating from the world's dominant economies have greater impacts on emerging economies (Abaidoo and Ellis, 2016; Dakhlaoui, and Aloui, 2016; Sum, 2012). Particularly, the study of Sum (2013) suggests that ASEAN countries' stock markets are negatively affected by economic policy uncertainty of the US. Therefore, being an emerging economy, the Malaysian stock market tends to be negatively affected by global economic policy uncertainty. Moreover, Sum (2013) examines effects of US economic policy uncertainty on the Malaysian stock market, but has not examined the subject from the global economic policy uncertainty perspective.

Recently, the relationship between global risk factors and stock market returns has been treated as non-linear (see Arouri, 2016; Basher *et al.*, 2018; Bijsterbosch and Guerin, 2013; Kang and Ratti, 2015; Ko and Lee, 2015; Zhu, 2017). The rationale behind this is that the stock market behaviour may have developed structural changes or shifts due to events such as oil price shocks, financial market crash, financial policy changes, geopolitical changes and political changes. So, changes in stock market behaviour may have an asymmetric relationship with risk factors depending on phases and conditions of market performance. On this in particular, economic theory also states that unstable economic conditions can lead to changes in consistency in the relationship between stock markets and influential risk factors (Bijsterbosch and Guerin, 2013). Therefore, in such cases, the linear model may not be able to capture the relationship between global risk factors and stock market returns. To detect the existence of a non-linear relationship, Markov switching (MS) models are the best tools to be employed. The Markov regime-switching models of Hamilton (1989, 2010) are the most popular non-linear time series models, which allow time-varying effects across regimes. The models are very efficient because they take into account most of the adjustments which are driven by exogenous events. Recently, Arouri (2016) has employed the MS model in estimating impacts of economic policy uncertainty on the US stock market. This study investigates impacts of global economic policy uncertainty on Malaysian stock market returns using both a linear regression model and a Markov switching regression model. The findings from the estimations will help economic agents such as retail investors, institutional investors, international investors and policymakers to understand the influences of global risk factors on stock market performance. Hence, economic agents can make their respective decisions effectively.

The study contributes to the existing knowledge in several important ways. Firstly, this study analyses the impact of global factors on emerging stock market performance by taking into consideration the latest GEPU index. Thus, it adds significantly to the literature on GEPU and the emerging stock market context. Secondly, this study utilizes a two-regime switching model to distinguish the impact of GEPU on emerging stock returns during low as well as high volatility periods. This captures non-linearity of effects of parameters. Thirdly, the findings of this study confirm that the effects of a global factor on any stock market returns depend on the different market states. Hence, this study extends the literature on global factors and non-linear effects. Fourthly, the findings suggest that, like EPU, GEPU can also serve as an emerging stock market performance predictor.

The rest of the paper is structured as follows. Section 2 presents a brief background literature. Section 3 discusses the dataset with a preliminary analysis. The next section describes the empirical method together with the empirical results. The final section provides concluding remarks.

2. Background Literature

Theoretically, it can be assumed that global economic policy uncertainty affects stock market returns of any economy in various ways. Firstly, economic agents are highly exposed to economic policy changes, which is reflected in their decisions in terms of employment, consumption, savings, and investments (Arouri *et al.*, 2016; Gulen and Ion, 2013). Such consideration affects investors' behaviour; therefore, stock market performance could be affected. Secondly, global economic policy uncertainty may bring some changes in capital inflows into and outflows from the economy. Hence, changes in capital inflows and outflows can affect stock market performance. Thirdly, it is evident that global economic policy uncertainty and oil prices are inter-related (Kang *et al.*, 2013, 2015, 2017a, 2017b). Changes in global economic policy can affect stock prices through oil prices as oil prices are an influential factor in the economy. Fourthly, global economic policy uncertainty can create domestic economic uncertainty, which leads to sudden changes in factors such as inflation, interest rate and exchange rate. Therefore, it is realistic that changes in inflation, interest rate and exchange rate can affect stock prices by affecting firms' discounted cash flows (Arouri *et al.*, 2016; Pastor and Veronesi, 2013). So, it is believed that global economic policy uncertainty can affect stock prices by affecting macro-economic fundamentals. Fifthly, since rational investors think that economic policy uncertainty can reflect future uncertainty, they may not further invest in an asset. As a result, such reflection could lead to a crash in stock market performance.

The literature strands relating to impacts of economic policy uncertainty on stock prices/returns has been growing extensively within a short span of time. The existing empirical studies have examined impacts of economic policy uncertainty on stock prices/returns with two empirical frameworks, namely linear and non-linear. For instance, under a linear assumption, Kang and Ratti (2013) find that US stock market returns are negatively influenced by increases in economic policy uncertainty. Similar findings have appeared in the studies of Antonakakis *et al.* (2013), Arouri *et al.* (2016), Brogaard and Detzel (2015), Pastor and Veronesi (2013), and Kang *et al.* (2017a, b). Under the same assumption, some existing empirical studies have evidenced that increases in economic policy uncertainty cause high volatility in stock returns (*e.g.*, Lui and Zhang, 2015). Furthermore, under a linear assumption, it is also evident that international economic policy uncertainty causes a drop in stock market returns (*e.g.*, Chang *et al.*, 2015; Sum, 2013). Moreover, Kang and Ratti (2015) add insights that the lag effects of policy uncertainty negatively affect real stock returns of China. In addition, under a time-varying linear framework, Ko and Lee (2015)

show the time-varying negative impacts of economic policy uncertainty on stock prices. Under a non-linear assumption, using the Markov switching regression, Arouri *et al.* (2016) find regime-dependent negative effects of economic policy uncertainty on US stock market returns. They also show that impacts of economic policy uncertainty on stock market returns are greater during the high volatility regime.

The theoretical explanation and literature presented above expose that economic policy uncertainty has negative impacts on stock market returns. It is also observed that there is a non-linear relationship between economic policy uncertainty and stock market returns. However, limited studies have investigated the non-linear relationship between economic policy uncertainty and stock market returns. Furthermore, none of the empirical studies presented above investigate the impacts of global economic uncertainty on stock market returns. Therefore, in this study, we investigate impacts of global economic uncertainty on Malaysian stock market returns using both linear and non-linear models.

3. Dataset Descriptions

This study uses monthly data for the Global Economic Policy Uncertainty index¹ from 09:2003 to 03:2017. The series comes from Baker *et al.* (2016). We use the KLCI Composite as a Malaysian stock market proxy. To find accurate effects of GEPU, this study considers a few macroeconomic variables as control variables, such as interest rate (see Nordin *et al.*, 2014), exchange rate (see Nordin *et al.*, 2014), and oil price (Janor *et al.*, 2013), which may have significant impacts on stock market performance. It is worth noting that the monthly frequency data choice is directed by the availability of data on the Global Economic Policy Uncertainty index.

Table 1 presents summarized results of descriptive statistics, normality test, unit root, and correlation matrix of the variables for the period from 09:2003 to 03:2017. This study finds that all the variables are stationary in the level form. As expected, we find a significant negative correlation between GEPU and stock market returns ($r = -37.90\%$, $p < 0.01$). Interestingly, GEPU has a negative relationship with oil price changes.

1 See Arouri *et al.* (2016) and Baker *et al.* (2016) for more details.

Table 1: Summary of Descriptive Statistics and Correlation Matrix

	Interest rate	Stock market	Oil price	GEPU	Exchange rate
Panel A: Summary statistics					
Mean	0.0007	0.0057	0.0078	0.0051	0.0012
Median	0.0000	0.0089	0.0064	0.0051	0.0000
Maximum	0.1091	0.1355	0.2898	0.2801	0.0985
Minimum	-0.2314	-0.1522	-0.3346	-0.2339	-0.0716
Std. dev.	0.0305	0.0360	0.0879	0.0896	0.0218
Skewness	-3.7233	-0.1849	-0.2583	0.4017	0.7922
Kurtosis	32.6616	5.9931	4.1504	3.8414	6.0094
Jarque-Bera	6,351.9890	61.7712	10.8014	9.1927	78.562
Probability	0.0000	0.0000	0.0045	0.0101	0.0000
Panel B: Unit root test with ADF test					
With constant	-7.03***	-11.43***	-10.09***	-12.25***	-12.31***
With constant and trend	-7.01***	-11.51***	-10.24***	-12.29***	-12.62***
Without constant and trend	-7.05***	-7.38***	-10.04***	-12.22***	-12.31***
Panel C: Correlation matrix					
Interest rate	1.0000	–	–	–	–
Stock market	-0.2295**	1.0000	–	–	–
Oil price	0.3133**	0.2684***	1.0000	–	–
GEPU	0.2133**	-0.3790***	-0.2464**	1.0000	–
Exchange rate	-0.1731*	-0.4112***	-0.3139***	0.1995*	1.0000

Notes: *, ** and *** denote statistical significance at the 10%, 5%, and 1% levels

Source: Authors' Calculations.

4. Empirical Methods and Discussion of Results

This study investigates whether GEPU has effects on the Malaysian stock market. Based on Arouri *et al.* (2016), we develop the following time-series model to investigate GEPU effects on performance of the Malaysian stock market.

$$\begin{aligned}
 MKT_{it} = & \alpha + \gamma_1 MKT_{it-1} + \varnothing_o \Delta GEPU_t + \varnothing_1 \Delta GEPU_{t-1} + \\
 & + \varphi_o \Delta INT_t + \omega_0 \Delta EX_t + \delta_0 \Delta OILprice_t + \varepsilon_t
 \end{aligned} \tag{1}$$

where MKT denotes stock market returns. ΔEX , ΔINT , $\Delta GEPU$, and $\Delta OILprice$ represent changes in exchange rate, interest rate, global economic policy uncertainty and oil price, respectively. ε is the error term. Unlike Aroui *et al.* (2016), this study includes the oil price factor as an additional factor in the model because Malaysia is an oil-exporting country and oil price changes have significant effects on stock market performance.

Table 2: Effects of GEPU on Stock Market

	Panel A		Panel B			
			High volatility regime		Low volatility regime	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	−0.041	−28.58***	0.007	2.86**	0.022	2.02**
Stock market (−1)	−0.13	−1.64*	−0.08	−0.98	−0.366	−1.99**
Exchange rate	−0.584	−8.30***	−0.60	−4.79**	−0.15	−0.29
Interest rate	−0.04	−2.19*	−0.04	−2.32**	0.16	1.35
GEPU	−0.34	−2.28**	−0.45	−2.87**	−0.05	−2.71***
GEPU (−1)	−0.19	−1.09	−0.23	−0.616	−0.03	−1.936**
Oil price	0.072	5.65***	0.004	4.12***	0.19	1.48
Oil price (−1)	−0.005	−1.41	0.034	2.05**	0.14	1.546
GARCH (−1)	0.759	5.9**	–	–	–	–
Adj R²	0.453	–	–	–	–	–
Log sigma	–	–	−3.969	−59.70***	−3.157	−36.59***

Note: *, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

Panel A presents GARCH (1,1) estimation of Equation 1

Panel B presents Markov switching estimation of Equation 5

Source: Authors' Calculations

Table 2 illustrates summarized results for the effects of GEPU on the stock market. At first, as the statistical distribution of the variables is not normal, this study employs a times series model (Equation 1) with a GARCH approach under the linearity assumptions. Model 1 shows estimations of the GARCH (1,1). The coefficient of one-lag stock market returns suggests that prior information related to the stock market has some predictability in Malaysian stock market returns. As expected, both coefficients of interest rate and exchange rate indicate that an increase in interest rate and exchange rate (depreciation)

negatively affects stock market returns. The oil price coefficient shows that changes in oil prices have significant positive effects on the Malaysian stock market with no lag effects. This indicates that an increase in oil price is favourable to the stock market. The finding is expected as Malaysia is a net oil-exporting country. As expected, the coefficient of GEPU suggests that global economic policy uncertainty has negative effects on the stock market. This finding is consistent with those of Antonakakis *et al.* (2013), Aroui *et al.* (2016), and Kang and Ratti (2013). Furthermore, this finding is also in line with Sum (2013) in terms of the negative effect of international economic policy uncertainty on an ASEAN economy.

In addition to the single-equation model, this study employs a simple recursive SVAR model with the same variables. The following y_t vector represents a vector of endogenous variables, and Equation 2 presents a reduced form of the SVAR. The variables are ordered with a block exogeneity assumption. Being a net oil-exporting and emerging country, oil price and global uncertainty play important roles in the Malaysian economy. Hence, oil price shock and GEPU shock, as influencing factors of the world economy, have direct impacts on interest rate (R), exchange rate (EX), and stock market (IPI).

$$y_t = [GEPU \text{ } OP \text{ } INT \text{ } EX \text{ } MKT] \quad (2)$$

$$G_0 C_t = G(L) C_{t-1} + \varepsilon_t$$

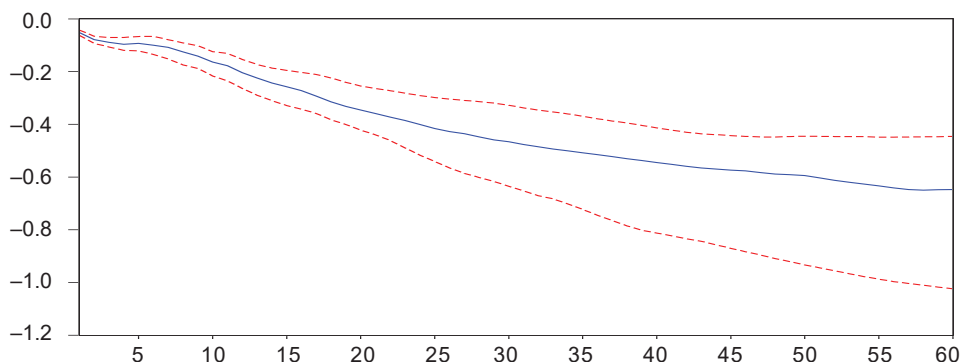
where C_t denotes endogenous variables, C_{t-1} is the lagged value and ε_t is a vector of white-noise error terms. The reduced VAR is presented with the following equation (3).

$$C_t = C(L) Z_{t-1} + \mu_t \quad (3)$$

where $C(L) = G_0^{-1} G(L)$ is the coefficient of lagged variables and $\mu_t = G_0^{-1} \varepsilon_t$ is observed as a vector of residuals, which are related to the structural shocks. So, $\varepsilon_t = G \mu_t$.

Figure 1 shows the response of the stock market to global economic policy uncertainty. The impulse response indicates that stock market responds negatively to global economic policy uncertainty and the effects of global economic policy uncertainty remain negative where the magnitude increases progressively with the existence of global economic policy uncertainty. This finding is consistent with the GARCH model estimation. An increase in global economic policy uncertainty leads to a decrease in stock market returns. Therefore, the global economic policy uncertainty index can be employed as one of the predictors of Malaysian stock market returns.

Figure 1: Response of Stock Market to Global Economic Policy Uncertainty



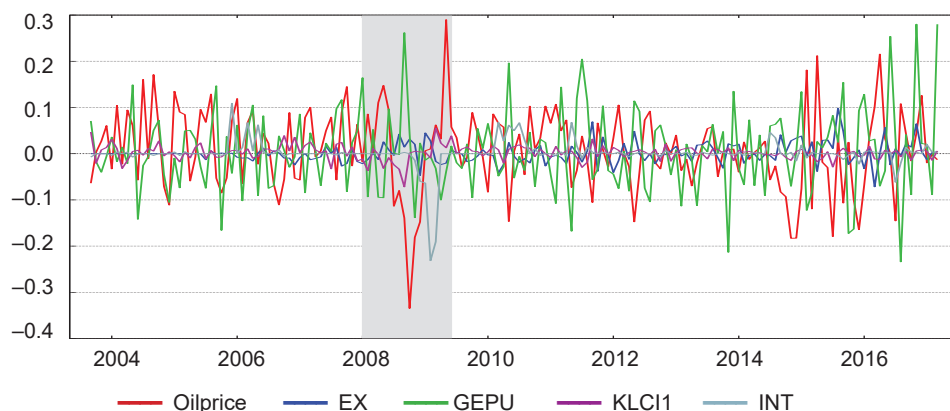
Source: Authors' Calculations

The above findings are mainly based on linear models and under the time-invariant assumption. So, the major drawbacks are that linear models do not consider time-variant effects of parameters and do not consider structural breaks and regime changes. If both concerns exist, they can cause the relationship between GEPU and Malaysian stock market performance to change and can create a regime-switching environment with different varying states. The regime-switching environment can be observed from Figure 2, which shows high volatility during the global financial crisis of 2008/09. Therefore, this study is inspired to investigate the impacts of GEPU on the Malaysian stock market under different regime-switching. Hence, this study develops a new non-linear time-series model under a Markov switching approach, which is presented in the following equation (4). In this model, we allow the market returns to switch with transition variables.

$$\begin{aligned}
 MKT_{i,t} = & \alpha_{i,s_t} + \gamma_{i,s_t} MKT_{i,t-1} + \omega_{i,s_t} \Delta EX_{i,t} + \phi_{i,s_t} \Delta INT_{i,t} + \\
 & + \varnothing_{0,i,s_t} \Delta GEPU_{i,t} + \varnothing_{1,i,s_t} \Delta GEPU_{i,t-1} + \delta_{0,i,s_t} \Delta OILprice_t + \\
 & + \delta_{1,0,s_t} \Delta OILprice_{t-1} + \varepsilon_{i,t}
 \end{aligned} \tag{4}$$

where s denotes regime states and all others are as in Equation 1.

Figure 2: Dynamic of Stock Market, Exchange Rate, Interest Rate, Global Economic Policy Uncertainty and Oil Price Changes



Source: Authors' Calculations.

Table 3: Transition Probability Estimation

LR statistics	45.28	P11 (low–low)	4.8298	4.27***
LR (prob.)	(0.00)	P22 (high–high)	–2.378	–2.18**
Akaike info criterion	–4.1491	Log–likelihood	756.07	–

Note: LR-test is the linearity test.

*, ** and *** denote statistical significance at the 10%, 5%, and 1% levels.

P11 and P22 are transition matrix parameters.

Source: Authors' Calculations.

This study tests Equation 4 for different specifications of the Markov switching regression. The two-regime regression model presents better-estimated results than others. This two-regime model helps this study to consider market states by low volatility and high volatility. Panel B of Table 2 presents summarized results of the Markov switching regression with two regimes. To save space, this study focuses directly on the analysis of the results. The log-likelihood ratio test indicates that the impacts of GEPU on the Malaysian stock market are of a non-linear form.

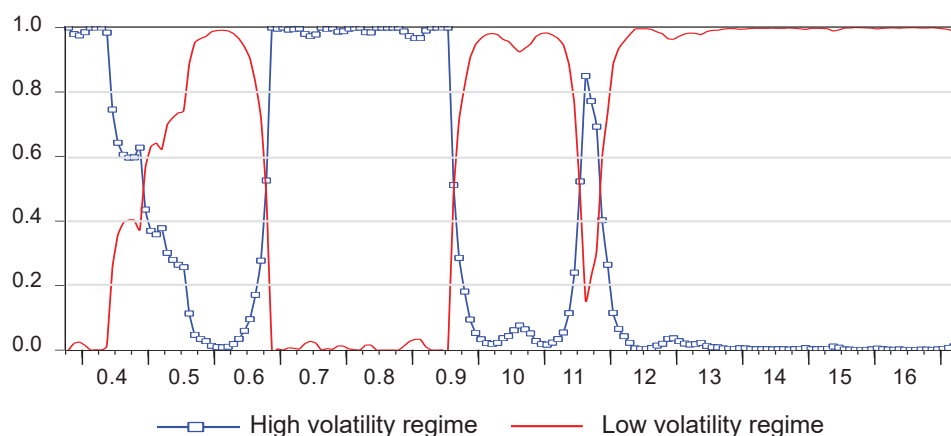
Furthermore, the significant difference between the log-sigma of the two regimes (low volatility regime = 3.15 and high volatility regime = 3.96) evidently indicates the non-linearity of the effects and existence of the two volatility regimes. Moreover, Table 3 and Figure 3 present an estimation of the time-varying transition probabilities,

suggesting that the probability to switch from the low (high) to the high (low) volatility regime is very high. The high volatility of the market largely comes from the financial crisis of 2008/09, and around 24% of the sample observations belong to the high volatility regime. This suggests that global economic policy uncertainty impacts the Malaysian stock market heterogeneously in different market states, while the impacts are stronger in the high volatility regime. This finding is consistent with Arouri *et al.* (2016) in that the effect of economic policy uncertainty on the stock market is non-linear. Furthermore, greater impacts of global economic policy uncertainty during the high volatility regime indicate that the stock market performance of Malaysia is not mainly affected by investors' behaviour; rather, it is affected by macro-economic fundamentals. The reason is that the risk of global economic policy uncertainty is mainly transmitted through domestic macro-economic fundamentals and policy arrangements.

Having consistency with the GARCH and SVAR models, the coefficients relating to impacts of global economic policy uncertainty show that, regardless of the volatility regime in Malaysian stock market performance, global economic policy uncertainty has negative impacts on Malaysian stock market performance. However, global economic policy uncertainty exhibits greater negative impacts during the high volatility regime. These findings are in line with those of Arouri *et al.* (2016). The reason for the greater negative impacts during the high volatility regime may also be due to investors' under-confidence towards global economic policy changes. Such under-confidence to global economic policy changes in the high volatility regime keeps investors from investing in the stock market. Therefore, the stock price drop happens on the stock market, which causes the stock market to generate more negative returns. Hence, greater negative impacts of global economic policy uncertainty are exhibited during the high volatility regime.

Focusing on the lagged impacts of global economic policy uncertainty in regime environments, this study finds that global economic policy uncertainty has significant negative lag effects on Malaysian stock market returns only during the low volatility regime. This finding shows some consistency with the findings of Kang and Ratti (2015). This finding indicates that the stock market does not fully reflect uncertainty in global economic policy in the low volatility regime. Therefore, the findings infer towards investors' under-reaction to global economic policy uncertainty in the low volatility regime.

Figure 3: Transition Probabilities of Two-regime Switching Model



Source: Authors' Calculations.

5. Concluding Remarks

This study examined the effects of global economic policy uncertainty on the Malaysian stock market for the period from 2003:09 to 2017:03, employing both linear and non-linear methods. The findings demonstrate that surges in global policy uncertainty lessen Malaysian stock market returns significantly. Curiously, the relationship between GEPU and the Malaysian stock market does not maintain linearity. The effects of GEPU on the Malaysian stock market are greater during the high volatility periods. In terms of asset pricing, aligning with the study by Tsai (2017), this study infers that GEPU is a global risk factor for the world financial market, so it is a systematic risk for Malaysian stock market performance. As such, it should be priced in any stock market performance around the world. In terms of the forecasting, the findings of this study imply that GEPU may be one of Malaysian stock market predictors as GEPU has a highly significant forecasting power.

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